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ABSTRACT

The final technical report is presented on the establishment and operation of an Exchange of Information among universities, corporations and government agencies concerned with the use of the computer as an aid to the instructional process. Four modes of information dissemination are described. A monthly dissemination of information on cards comprises the first mode; data distributed includes computer-assisted instruction (CAI) research abstracts, CAI program specifications, computer-managed instruction (CMI) research abstracts, and CAI facility descriptions. Descriptions of the seven conferences making up the second mode include special topics covered: CAI languages, CAI in technical education, CAI in health professions, simulation in CAI, and instructional strategies in CAI. The third mode consisted of a three-week workshop which is considered briefly in the report. The final mode, annual integration of the data into literature surveys, is also examined. Methods of data collection (site visits and questionnaires) and classification (construction of CAI and CMI thesauri) are included. (Author/SP)

ED038862

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COMPUTER-ASSISTED INSTRUCTION
INFORMATION EXCHANGE

Final Technical Report
for the period
1 February 1965 - 31 December 1969

Project NR 154 254
of the
Personnel and Training Research Programs Office
Office of Naval Research
Contract N00014-68-C-0236
(formerly Nonr-4757(00))

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COMPUTER-ASSISTED INSTRUCTION

INFORMATION EXCHANGE

Contract Nonr-4757(00)

Contract N00014-68-C-0236

FINAL TECHNICAL REPORT

1 February 1965 - 31 December 1969

**COMPUTER-ASSISTED INSTRUCTION
INFORMATION EXCHANGE**

**Final Technical Report
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KEY WORDS		LINK A		LINK B		LINK C	
		ROLE	WT	ROLE	WT	ROLE	WT
computer							
instruction							
information							
conference							
workshop							
thesaurus							

Abstract

This is the final technical report for contracts Nonr 4757(00) and N00014-68-C-0236 between the Office of Naval Research and ENTELEK Incorporated, whereby ENTELEK established and operated an Exchange of Information among universities, corporations and government agencies concerned with the use of the computer as an aid to the instructional process. Four modes of information exchange are described: (1) a monthly dissemination of information on cards, (2) conferences, (3) a workshop and (4) an annual integration of the data.

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I. INTRODUCTION

In 1965, to increase the flow of information in the fast-growing field of computer-assisted instruction (CAI), the Personnel and Training Branch of the Office of Naval Research initiated an exchange of information among institutions actively practicing CAI or conducting research in the field. To implement the CAI Information Exchange, ONR made contract Nonr 4757(00) with ENTELEK Incorporated. This contract was superceded in 1968 by contract N00014-68-C-0236.

At the outset, participants in the Exchange were primarily universities and other organizations under contract to ONR to do research in CAI, plus agencies of the federal government that had a need to keep abreast of the new technology. The Office of Naval Research was one of the first agencies to provide support for research in CAI. In 1965 the Personnel and Training Branch and the Information Systems Branch of ONR had CAI-related contracts with the University of Illinois, Stanford, MIT, Bolt Beranek & Newman, System Development Corporation and several other activities.

When the Exchange was established it was clear that there would be a rapid growth in the amount of CAI research and in the number of people who would want to participate in the Exchange, and that the Office of Naval Research could not justify full support of the Exchange indefinitely. Consequently, beginning in 1967, the level of ONR support was gradually reduced and the participants were asked to shoulder part of the cost, particularly the cost associated with the dissemination, as opposed to the

collection of data. At the termination of the contract in December 1969, the Exchange was self-sustaining with 250 institutions participating. The list of participants at that date is given in Appendix A.

Computer-assisted instruction has been defined by Dr. Glenn Bryan as any situation in which a student and a computer are in direct interaction with the objective of bringing about desirable behavior change, i. e., learning, in the student. A complementary use of the computer as an aid to the teacher in the process of instruction emerged in about 1968 and has come to be known as computer-managed instruction (CMI). In CMI it is the instructor who is the loop with the computer. The instructor inputs to the computer aptitude and achievement data for individual students and receives individual prescriptions for instruction.

CMI makes it easier to manage CAI and other techniques of individualized instruction, including programmed instruction. In 1969, the CAI Information Exchange was broadened to include CMI.

Dr. Albert E. Hickey was the principal investigator.

II. DESCRIPTION OF THE SERVICE

In the first year of the contract, ENTELEK project personnel met monthly with Dr. Bryan to establish the Exchange procedure. Two kinds of service emerged: 1. an exchange of information on cards and 2. conferences.

A. The Card System

1. The mainspring of the ENTELEK CAI/CMI Information Exchange is the monthly distribution of data on cards bound in book form. Each monthly book has about 190 pages of data. The user may browse through the book and then shelve it, or he may remove the cards to create a comprehensive file on CAI and CMI, as described below. Some 35 sets of data have been distributed since the Exchange began.
2. There are four kinds of data in each monthly volume of cards: (1) abstracts of the CAI literature, (2) specifications of CAI programs, (3) abstracts of the CMI literature, and (4) descriptions of CAI/CMI facilities. Each kind of data is printed on color-coded cards to permit quick classification. A sample of each type of card is shown in Appendix B.
3. A steel file cabinet complete with 100 dividers, each printed with a caption, is provided to permit easy filing of the data cards. The result is an integrated, up-to-date library tool. The organization of the file is shown in Figure 1.

4. When the user first joins the Exchange, he receives microfiche containing all the CAI/CMI data distributed since 1965. The fiche are accompanied by complete indexes to permit retrieval of data by subject, author, etc.

B. The Survey of the Literature

Since mere accumulation of data is no answer to the explosion of technical information, ENTELEK publishes an annual survey and synthesis of the data that have passed through the Exchange from its inception. Research findings are interrelated, trends identified, and obsolete information deleted. Three editions of the Survey were published during the term of the contract. Under the phasing-out agreement the third edition was published by ENTELEK in October 1968 at no cost to the contract. The first three editions were edited by Dr. Hickey. A fourth edition is currently being prepared by Cornelius Butler of Stanford University.

C. Conferences

During the contract years of 1965, 1966, 1967 and 1968 seven conferences on CAI were sponsored by ONR under the ENTELEK contract. Three of the meetings were conducted at CAI research centers (Stanford, Illinois and the System Development Corporation) to give more exposure to the work of those projects. Four of the meetings were devoted to specific topics in CAI. A brief description of each conference follows:

1. Stanford University
2. University of Illinois
3. CAI Languages (Cambridge, Mass.)
4. CAI in Technical Education (Pennsylvania State University, April 1967)
5. Simulation in CAI (University of Texas, January 1968)
6. CAI in the Health Profession (Harvard University, February 1968)
7. Instructional Strategies Appropriate to CAI (Washington D.C., October 1968)

From 25 to 40 members of the CAI interest group attended each meeting. ENTELEK published the proceedings of each. In the final year of the contract the topical meetings were superceded by four regional meetings conducted by ENTELEK at no cost to the contract under the "phasing out" policy. The proceedings of these meetings were also published by ENTELEK. The second round of regional meetings was recently held and the proceedings are now in preparation.

Since 1968 sponsorship of national meetings on CAI has been assumed by various professional and user groups, e. g. , the National Security Industrial Association; ADIS, the IBM educational user's group; et al.

D. CAI Workshop at the Naval War College

From its vantage point in the Office of Naval Research, the Personnel and Training Branch felt that the summer of 1966 was the opportune time to demonstrate CAI to Navy educators and to give selected instructors the opportunity to learn to apply the new CAI technology to their teaching

objectives. To this end, ONR organized three CAI workshops for the summer of 1966.

1. At Project PLATO, University of Illinois, for Naval Academy faculty.
2. At the Naval Academy, Annapolis, for Naval Academy faculty.
3. At the Naval War College, Newport, for the faculties of Navy schools in the Newport area.

ENTELEK conducted the CAI workshop at the Naval War College, a three-week program extending from July 11 to 28. The objectives of the Newport workshop were to review the state of the computer-assisted instruction art in terms of its application to the U. S. Navy, with special emphasis on the activities at Newport, and to provide guided practice in writing CAI programs to a selected group of Naval officers on the Newport base.

Representatives were designated by the War College, Officer Candidate School, Destroyer School, Correspondence School, and Naval Supply Depot. The program gave equal time to (1) "hands-on" demonstration and practice with time-shared computer utilities and (2) presentations on man-computer interaction by guest lecturers.

Connections were established with remote computers at Bolt Beranek and Newman, General Electric, and IBM Yorktown. Interaction was also established with the concurrent workshop at the Naval Academy through the G. E. computer.

The staff and guest lecturers for the workshop included Professors Ward Edwards (University of Michigan), Philip Merrifield (Kent State), John Poppe (ICAF) and Harold Guezkow (Northwestern). Also Dr. John Summers (MITRE) and Mr. Wallace Feurzeig (Bolt Beranek and Newman).

Drs. Hickey and Gordon M. Becker conducted the workshop for ENTELEK.

III. DATA COLLECTION AND CLASSIFICATION

A. Site Visits

A primary objective of the Exchange has been to achieve a short lag in the distribution of CAI data. Consequently, ENTELEK adopted an active rather than a passive approach to data collection. From 1965 through 1969 ENTELEK personnel visited virtually every major CAI facility in the U.S. and attended the principal conferences at which reports of CAI research were given. Over 60 such visits were made in all. A list of sites visited is given in Appendix C.

B. Questionnaires

To capture data for the Exchange ENTELEK formulated a questionnaire for each kind of data:

- (1) CAI Research Abstract
- (2) CAI Program Specification
- (3) CMI Research Abstract
- (4) CAI Facility Descriptions

A copy of each appears in Appendix D.

C. CAI and CMI Thesauri

To classify the data on CAI, and later on CMI, it was necessary to build two thesauri, since the two subjects had not been covered in such detail before.

The same thesauri serve to organize the contents of CAI: A Survey of the Literature. They appear in Appendix E.

ENTELEK CAI CARD FILE ARRANGEMENT

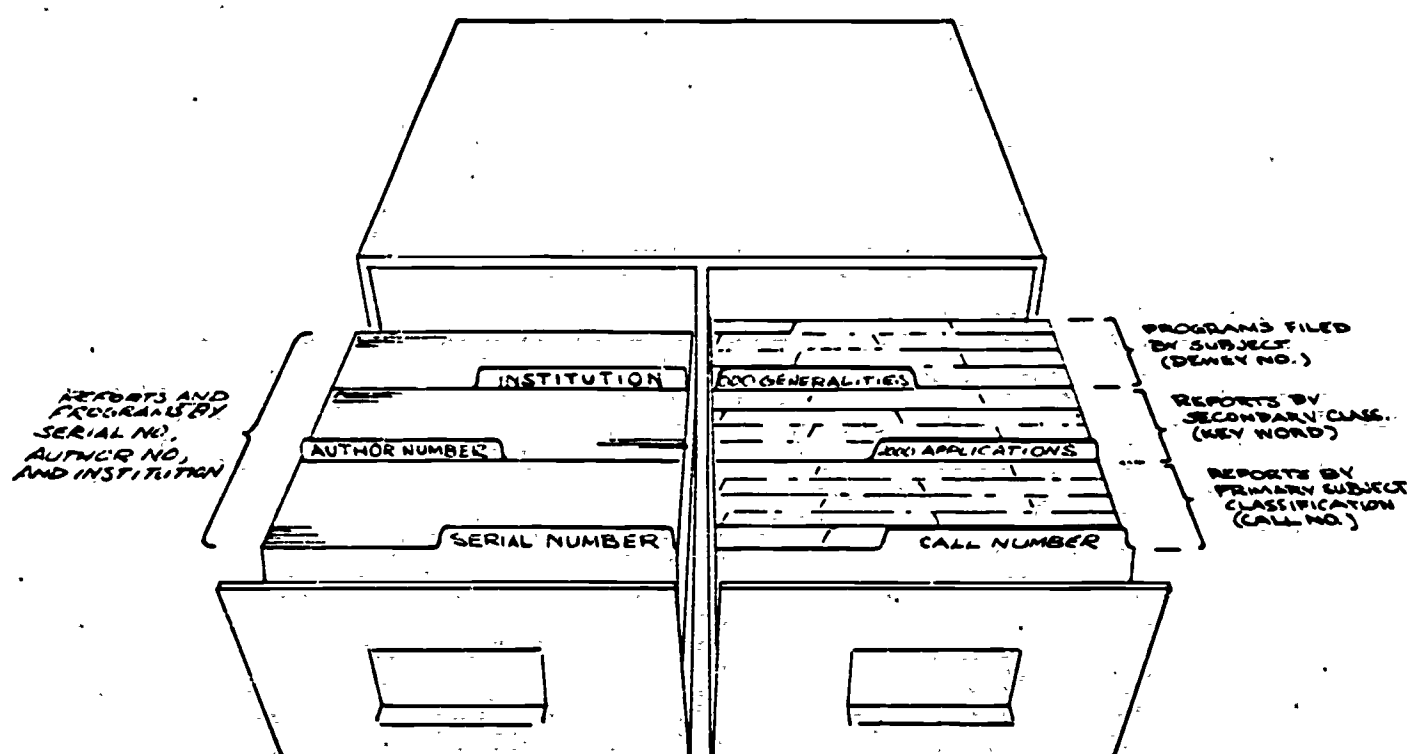


Figure 1.

APPENDIX A.

<u>Name</u>	<u>Institution or Organization</u>
Dr. J. Annett	Hull University, England
Prof. Richard C. Atkinson	Stanford University
Dr. Richard Balomenos	National Science Foundation
Richard Barry	Off. of Info. Sys. Planning and Development
Mr. Roger Berkshire	U. S. Naval School of Aviation Medicine
Dr. D. L. Bitzer	PLATO, Univ. of Illinois
Dr. A. deBrisson	Centre d'Etudes et de Recherches, France
Prof. C. Victor Bunderson	Univ. of Texas
Sqn Ldr. Ivor K. Davies	Royal Air Force
Dr. Barrett Denton	Behavioral Sc. Lab., Wright-Patterson AFB
Directorate of Individual Training	Off. of Asst. Secy. of Defense (Manpower)
Mr. James S. Duva	Naval Training Device Center
E. Elliott, Esq.	Ministry of Defense (Navy), England
Dr. Gerald Engel	U.S. Naval Weapons Lab.
Dr. Wallace Feurzeig	Bolt Beranek and Newman
Dr. Victor Fields	Office of Naval Research
Dr. John D. Ford	U. S. Naval Personnel Research Activity
Capt. J. E. Forrest	USN, Ind. College of the Armed Forces
Dr. Eugene E. Glove	Office of Naval Research
Dr. Duncan Hansen	Florida State University
Mr. Larry G. Harding	Naval Air Station
Mr. Anthony M. Hodgson	Inst. for Comp. Study of Hist., Phil. & Sc., ENG.
M. O. Houziaux	Inst. de Mathematique, Belgium
Capt. Geoffrey Huggett	Greystoke, England
Mr. Max Jerman	Stanford University
Dr. Felix F. Kopstein	HumRRO, G. Washington Univ.
Mrs. Betta H. Kriner	Penn State Univ.
Dr. Herbert F. LaGrone	Texas Christian Univ.
F. H. Lakin	Defence Operation Anal. Establishment, ENG.
Dr. J. C. R. Licklider	M. I. T.
Dr. Sylvia R. Mayer	HQ ESD (ESVPT), Hanscom Field
Major John R. Parker	U. S. Military Academy
Mr. Adrian Parmeter	Office of Education
Gordon Pask, Esq.	System Research Ltd., England
Capt. Edward M. Porter, Jr.	Naval War College
Dr. Paul Quinn	U. S. Naval Academy
Mr. William W. Ramage	Univ. of Pittsburgh LRDC
Dr. Joseph W. Rigney	Univ. of Southern California, L. A.
Dr. Ray Roberts	Naval Pers. Prog. Support Activity
Dr. Harry Silberman	System Development Corp.
Dr. H. Wallace Sinaiko	Office of Naval Research Branch Office
Dr. Lawrence M. Stolurow	Harvard Computing Center
Mr. Harley Tillitt	U. S. Naval Ordnance Weapons Center
Mr. Earl K. Wallace	USAFHQ (AFP-TRD)
Dr. Richard L. Wing	BOCES
Dr. Karl L. Zinn	Univ. of Michigan - CRLT

<u>Name</u>	<u>Institution or Organization</u>
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Dr. Louis A. Formica	Mineola Public Schools
Mr. John R. Crocker	Minnesota School Districts
Special Education Dept.	University of Minnesota
Department of Sociology	The University of Minnesota
Mr. William L. Stucker	Univ. of Missouri Regional Medical Program
--	The Mitre Corporation
--	Montgomery County Public Schools
Product Specifications Dept.	The National Cash Register Co.
Chief, Training Unit	Natl. Communicable Disease Center
John Duke	Natl. Council for Educational Tech., England
Training Supervisor	NATTC, Naval Air Station
Technical Reference Library	Naval Medical Research Institute
Washington Navy Yard	(Navy) Personnel Research Laboratory
David H. Brand	N.E. Medical Center Hospitals
Speech Dept.	New Mexico State University
Mr. Hugh McDougall	Board of Education - City of New York
Prof. A. Dorman	New York City Community College
Dr. Cyril H. Price	New York City Community College
Dr. F. Brooks Sanders	State University of New York
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Order Librarian	State University College (Potsdam, N. Y.)
Computing Center	N. Y. State Univ. Downstate Medical Center
Prof. Richard L. Muller	N. Y. State Univ. Hosp., Upstate Med. Ctr.
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--	Northern Virginia Community College
--	Northwest Regional Educational Lab
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Dr. Edwin G. Novak	Ohio State University, Evaluation Ctr.
James V. Griesen	Ohio State University Hospital
Serials Division	Ohio State University Libraries
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Acquisitions Librarian	Oklahoma State University Library
College of Education	University of Oklahoma
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M. William Lee	Quebec Ministre de l'Education
Computer Center	Queens College (CUNY), Bd. of Higher Educ.
Mr. Jerome D. Carp	Radio Corporation of America

NameInstitution or Organization

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(" ") W. E. Hurley	Maxwell Air Force Base, Info. Science
(" ") Lt. Col. D. Ford	Wright-Patterson AFB Schl. of Logistics
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Rec'g. Dept. Parnassus at Arguello	University of California (L. A.)
School of Education,	University of California-S.F. Medical Ctr.
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Dr. Ian C. Bennett	Univ. of Kentucky Medical Center
Dr. John G. Navarra	Learning Resources Laboratories
John K. Taylor	LIBERTY Council of Schools
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Purchasing Office	Miami University

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Org. 3132, R. F. Utter	Sandia Corporation
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Mr. Donald P. Ney	Texas A & M University
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Library	The University of Toledo
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Prof. John J. Lenahan	University of Wisconsin
Library	Xerox Education Division

APPENDIX B.

Sample of Data Cards

S000
S927

68-1030/31

Strum, Irene

Use of CAI in New York State Public Schools

New York
State
3300

Summary report, Board of Cooperative Educational Services #1
(BOCES), Yorktown Heights, N. Y. ; October 1968.

El-hi
2735

The purpose of this investigation was to study in depth the use of computer-assisted instruction (CAI) in New York State public school districts. As a follow-up to a study by the State Education Department, questionnaires were sent to eighty chief school administrators who had indicated that they were engaged in CAI. On the basis of 39 returns, it was found that eight schools were actually engaged in CAI.

Craig School, Schenectady - teaches math, language arts, and social studies for grades 1 to 5; programs written by teachers in Basic and Fortran. GE computer used belonging to GE Research and Development Lab; one GE terminal. Computer operations financed through GE Lab.
Half Hollow Hills High School, Huntington - teaches science for 10-12 grade; programs written by professors at Brooklyn Polytechnic Institute
(over)

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1300
S582

M68-0201/30

Silberman, Harry F. (System Development Corp.)

Design Objectives of the Instructional Management System

Paper presented at AERA annual meeting, February 8, 1968.

To help the teacher make more accurate decisions about the daily presentation of lessons, an Instructional Management System, called IMS, is being developed by the System Development Corporation and the Southwest Regional Laboratory. IMS is currently operating in two elementary schools in the Los Angeles City School District. Its purpose is to provide diagnostic and prescriptive information to the teacher to assist her in making such instructional decisions as how fast to pace instructional units, when to re-group students, and how to modify the sequence of instruction. The testing and information system of the Instructional Management System is described briefly.

Three design objectives guided the development of IMS:

- 1) An evolutionary approach to implementation
- (over)

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330
R522

P69-0206/28

1. MAC03
- 1a. Elementary Keynesian macroeconomic models (4)
2. Richardson, David A.
3. College students in introductory economics course
4. No prerequisites
5. User time varies with level of sophistication from 1/2 to 1 hour.
6. Socratic and tutorial
7. FORTRAN IV
8. IBM 1802 (16K core storage and 16 bit words; core requirement is 3500 words)
9. Teletypewriters
10. Handout stating basic model equations and definitions
11. Reports available from Director of Beloit College Computing Center
12. Beloit College Computing Center, Beloit, Wisconsin
13. Available upon request
14. See also MIC01 (P69-0205), MAC05(P69-0207) and Facility Description F69-0203
15. Specifications submitted in February 1969
16. National Science Foundation (COSIP grant) and Beloit College

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F68-1202/28

1. Air Force Institute of Technology, School of Systems and Logistics, Computer Support Department
2. Wright-Patterson Air Force Base, Ohio 45433
3. Director: Captain D. Veasey
4. Key personnel: ILT David B. Loveman
5. Facility is operational
6. Computer is general purpose
7. Central Processor: IBM 1620 II
8. CPU is at facility
9. Processor Controllers: --
10. Storage: 2 disks (2 million digits each)
11. On-line I/O:
 - a. Terminals: Teletypes (Model 35)
 - b. Auxiliary visual displays: --
 - c. Audio I/O: --
 - d. Other: --
12. Data-processing I/O:
 - a. Card-reader punch: IBM 1622
 - b. Paper tape: --
 - c. Magnetic tape: --

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APPENDIX C

SITE VISITS AND CONFERENCES ATTENDED

<u>CAI Site</u>	<u>Man Days</u>
System Development Corporation	5
Stanford University	2
Dartmouth College	1
Providence College	2
Brown University	1
Philco-Philadelphia	1
USNA	1
U/Pitt LRDC	1
Bolt, Beranek and Newman	3
Harvard University	3
Pennsylvania State University	5
Dartmouth College	2
Harvard University	10
U.S. Navy Training Device Center	1
U.S. Naval Academy	1
University of Pittsburgh	2
American Educational Research Assoc. (Annual Meeting)	4
Association for Educational Data Systems (Workshop)	1
School District of Philadelphia	2
U.S. Navy Medical School	1
Office of Under Secretary of Defense (Man)	1
IBM Instructional Systems Mktg. Dept.	1
American Management Association Conference on Educational Technology	6
Project ARISTOTLE Symposium	2
ONR Conference, Washington, D. C.	6
Dartmouth College	1
Assoc. for Programmed Learning (UK)	4
Nat'l. Council Teachers of Mathematics	8
Am. Soc. for Training and Develop.	4
Am. Assoc. of School Admin.	2
Am. Educ. Research Assoc. Annual Meeting	
U/Pitt LRDC	
U/Mass. Educ. Adm. Conference	
Lehigh University, Psychology Department	
Nat'l. Council Teachers of Mathematics	
Assoc. for Educ. Data Systems Annual Conf.	
Spring Joint Computer Conference	
Am. Management Assoc. 5th Education and Training Equipment Exposition	

ENTELEK CAI/CMI Regional Conferences

Chicago, February 4, 1969

Los Angeles, February 1969

Chicago, October 1969

New York, October 1969

Washington, D. C., November 1969

APPENDIX D.

Data Collection Questionnaires

ENTELEK CMI RESEARCH ABSTRACT

Entelek call no.

Entelek serial no.

**Cutter Sanborn
classification no.**

1. Author(s) _____
2. Author's Affiliation (if not that of the originating activity) _____
3. Title _____
4. Originating activity of corporate author (include the subordinate unit of the organization) _____
5. Type of document (e. g. final report, interim report, thesis, etc.) _____
6. Report date (day, month, year) _____
7. Report no. _____ 8. No. of pages _____ 9. No. of references _____
10. Sponsoring agency and contract or grant no. (if any) _____
11. Abstract _____

- (Please continue on other side if necessary.)
12. Key words or retrieval terms (up to 7) _____

The abstract (item 11 above) should not be over 200 words in length. Please emphasize facts and conclusions. We shall supply the Cutter (author) number, call number and ENTELEK serial number.

ENTELEK CAI RESEARCH ABSTRACT

Entelek call no.

Entelek serial no.

**Cutter Sanborn
classification no.**

1. Author(s) _____
 2. Author's Affiliation (if not that of the originating activity) _____
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 4. Originating activity of corporate author (include the subordinate unit of the organization) _____
 5. Type of Document (e. g. final report, interim report, thesis, etc.) _____
 6. Report date (day, month, year) _____
 7. Report no. _____ 8. No. of pages _____ 9. No. of references _____
 10. Sponsoring agency and contract or grant no. (if any) _____
 11. Abstract _____
- (Please continue on other side if necessary.)
12. Key words or retrieval terms (up to 7) _____

The abstract (item 11 above) should not be over 200 words in length. Please emphasize facts and conclusions. We shall supply the Cutter (author) number, call number and ENTELEK serial number.

ENTELEK CAI PROGRAM SPECIFICATIONS

Dewey Decimal
classification no.

Entelek Serial no.

Cutter Sanborn
classification no.

1. Program name _____
- 1a. Subject matter _____
2. Author(s) _____

3. Target population _____

4. Curriculum relationships (e. g. prerequisites) _____

5. Length of program _____
6. Instructional logic (e. g. tutorial, sooratic) _____
7. Instructional language (e. g. COURSEWRITER) and/or compiler _____

8. Computer(s) (incl. storage requirements) _____

9. I/O Devices (e. g. terminals) _____

10. Auxiliary equipment or materials (e. g. , notebooks, projectors) _____

11. Performance results (e. g. published reports) _____

12. Installations _____
13. Availability _____
14. See also ENTELEK Program Abstracts _____

15. Source documents _____

16. Sponsoring Agency _____

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1. Official name of the CAI facility: _____
2. Address: (Street) _____
(City) _____ (State) _____ (Zip) _____
3. Director: _____
4. Names and titles of
additional key personnel: _____
5. Facility is operational _____ or in development _____
6. Indicate whether general purpose _____ or special purpose _____ computer
7. *Central Processor: _____
8. CPU is at facility _____ or is remote _____
9. *Processor Controllers (incl. number): _____
10. *Storage (disk, tape, etc.; incl. capac): _____
11. *On-line I/O: _____
 - a. Terminals (including number of each kind) _____
 - b. Auxiliary visual displays _____
 - c. Audio I/O _____
 - d. Other _____
12. *Data-processing I/O: _____
 - a. Card-reader punch _____
 - b. Paper tape _____
 - c. Magnetic tape _____
 - d. Line printer _____
 - e. Plotter _____
 - f. Other _____
13. Programming Systems and Languages:
 - a. Assembler _____
 - b. Compiler _____

(Over)

APPENDIX E.

CAI and CMI Thesauri

ENTELEK CAI/CFI INFORMATION EXCHANGE

CAI THESAURUS

1000-1999 GENERAL INFORMATION

1000. General

- 1010 Literature review or surveys
- 1020 Bibliographies
- 1030 Source documents for CAI instructional programs

2000-2999 APPLICATIONS OF CAI

2000 Instructional programs by subject matter - General

2100 Mathematics and Statistics - General

- 2101 Algebra
- 2102 Arithmetic, binary
- 2103 Algebraic proof
- 2104 Number squaring, cubing, etc.
- 2105 Statistics, descriptive
- 2106 Statistics, inferential
- 2107 Arithmetic, elementary school

2120 History - General

- 2121 American history

2140 Languages - General

- 2141 English
- 2142 Logic: Syllogisms
- 2143 Spanish
- 2144 German
- 2145 Chinese

2160 Science - General

- 2161 Medicine
- 2162 Physics
- 2163 Science, elementary
- 2164 Genetics

2180 Economics - General & Social Sciences

- 2181 Economics games

2220 Engineering - General

- 2221 Structures
- 2222 Dynamic systems
- 2223 Electrical

2240 Computer technology - General

- 2241 Computer approaches to engineering problems
- 2242 Computer programming
- 2243 Computer use

2260 Games - General

- 2261 Bridge
- 2262 Roulette
- 2263 Tic-Tac-Toe

2270 Decision-making

2280 Intellectual skills

- 2281 Reading
- 2282 Concept acquisition
- 2283 Problem-solving

2300 Task skills

- 2301 Keyboard operation

2302 Metal surfaces, discriminating smoothness

2303 Non-verbal sounds

2304 Nursing, clinical methods

2305 Task logic

2306 Typing

2307 Library maintenance

2308 Electronic operation and maintenance

2320 Other specific applications of CAI

2330 Creativity

2400 Counseling

2500 Library retrieval

2700 Level of Application of CAI - General

2710 Retarded children

2720 Special education

2730 Elementary school

2740 Secondary school

2750 Vocational

2760 College

2770 Continuing

2771 Inservice Teacher Education

2780 Industrial

2790 Military

3000-3999 CAI SYSTEMS

3000 Systems - General

3100 Systems analysis

3200 Common system characteristics

3210 Time-sharing

3220 Response processing

3400 I/O Equipment - General

3401 Display techniques

3410 Response techniques

3500 Central Processing Units

3501 GE-235 and D-30

3502 GE 245

3510 IBM 1400 series

3511 IBM 7094

3512 IBM 1620

3513 IBM 650

3514 IBM 7090

3515 IBM 360 series

3516 IBM 1800, 1130

3520 DEC PDP series

3525 CDC 1604

3530 ILLIAC

3535 Bendix G-20

3536 UMSH

3537 Ural-1

3538 Solomon

3539 SDS 940

3600 Student Variables - General

3610 Individual differences

3620 Motivation

3700 Storage

3800 Systems

3801 IBM/System 1500

ENTELEK CAI/CMI INFORMATION EXCHANGE

CAI THESAURUS

3860	RCA/Instructional 70	5165	Response Mode
3861	RCA/Instructional 71	5170	Response Measurement
3870	Technomics 6700	5171	Response Latency
3900	Training Subsystems	5200	Instructional logics
3901	System 473L	5201	Tutorial
4000-4999	PROGRAMMING LANGUAGES	5202	Intrinsic
4000	Languages - General	5203	Adaptive
4001	Natural language	5204	Socratic
4010	Problem and calc. languages	5205	Drill & Practice
4011	BASIC	5206	Learner Controlled
4012	TEACH	5300	Simulation
4013	SIMIN	5400	Game
4014	APL	5500	Testing
4015	TOLCOMP	6000-6999	PROGRAMMED INSTRUCTION
4016	ESI	6000	General
4017	CAL	6100	Sequence variables
4018	FOCAL	6101	Subject-matter structure
4100	Teacher languages	6200	Adaptivity (Individualizing)
	(incl. text processing languages)		Decision Structure - General
4101	COURSEWRITER	6210	Instructional Alternatives
4102	MENTOR	6220	Decision logic
4103	CATO	6300	Frame construction
4104	COMPUTEST	6400	Program Generation
4105	PLANIT	6500	Motivation
4106	ELIZA	7000-7999	GENERATION & EVALUATION
4107	ISL-1	7100	Methodology
4200	Problem-oriented student	7200	Results
	languages	8000-8999	ADMINISTRATION
4201	STRESS	8000	General
4202	COGO	8100	Conferences and workshops
4203	SFPOL	8200	Cost Analyses
4300	Compilers	8300	Regulations
4301	ALGOL	8301	Copyright
4302	DIP	8302	Communication tariffs
4303	EDIT		
4304	FORTRAN		
4400	Interpreters		
4500	Assemblers		
4501	PDP-8		
4600	Utility programs		
4601	PDP-8		
5000-5999	INSTRUCTIONAL THEORY		
5000	General		
5100	Studies of learning		
5101	Paired-associates learning		
5110	Learning set		
5120	Inspection behavior		
5130	Problem-solving		
5135	Concept formation		
5140	Computer simulation of human		
	learning and problem-solving		
5145	Artif. Intelligence		
5150	Pattern Recognition		
5160	Learning Models		

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CMI THESAURUS

- 1000 General
 - 1100 Educational Goals
 - 1200 Bibliographies
 - 1300 Literature Reviews or Surveys
 - 1400 General Periodicals
- 2000 CMI System Design
 - 2100 General System Design and/or Theory
 - 2200 CMI Environment
 - 2210 Physical Plant
 - 2220 Management Information System
 - 2230 Staff
 - 2231 Requirements
 - 2232 Organization
 - 2233 Training and Development
 - 2300 Hardware
 - 2310 CPU
 - 2320 Terminals
 - 2330 Storage
 - 2400 Software
 - 2410 Compilers
 - 2411 COBOL
 - 2500 System Evaluation and Optimization
 - 2600 Prescription Generation
 - 2700 Results
- 3000 Subject Matter
(Use Dewey headings)
- 4000 Educational Objectives
 - 4100 Behavioral Objectives
- 5000 Instructional Alternatives
 - 5100 Content
 - 5200 Sequence
 - 5300 Media and Learning Materials
 - 5400 Grouping
- 6000 Testing
 - 6100 Entry and Prior
 - 6110 Aptitude
 - 6120 Achievement
 - 6130 I. Q.
 - 6200 Internal Testing
 - 6210 Pre-tests
 - 6220 Post-tests
 - 6230 Curriculum-embedded Tests
- 7000 Decision-Making
 - 7100 Among Instructional Alternatives
 - 7200 Among Career Alternatives
 - 7210 Guidance, counseling

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Hull University
Yorkshire
England

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